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Climate and Crop Yields Marshall County

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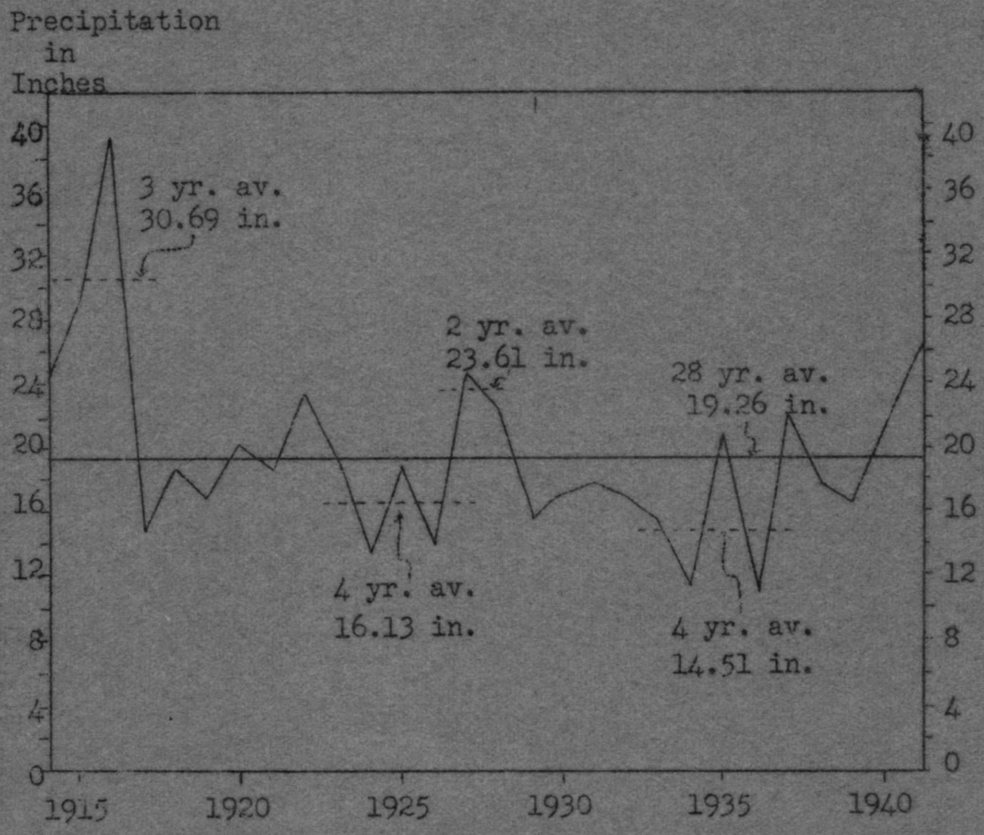
CLIMATE AND CROP YIELDS

MARSHALL COUNTY



Average Crop Year (Sept. 1 of previous year to Aug. 31 of designated year) Precipitation at Britton, South Dakota, 1913-1941. The amount of precipitation varies greatly from year to year and from period to period. Precipitation is a major factor in crop yields (table III).

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THE COUNTY PAMPHLET SERIES

IN

AGRICULTURAL ECONOMICS

The County Pamphlet Series in Agricultural Economics is intended to make available to each county economic data concerning its farm history and present agricultural situation. It is hoped that these facts will be of use to county planning groups, individual farmers, research and extension workers and other persons interested in the agriculture of the counties.

Each pamphlet will treat one subject for one county, and is to be released when completed. Pamphlets on various other economic subjects for the different counties will be prepared as soon as possible.

A few copies of each pamphlet will be placed with the county extension agent and a limited number will be sent to private persons upon request.

The project was initiated by the Department of Agricultural Economics and the work is under the direction of its regular staff.

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Climate and Crop Yields

Prepared under the direction of Aaron G. Nelson and Virgil Wintrode

Climate is one of the principal limiting factors in South Dakota agriculture. A knowledge of its effects on crop conditions should, therefore, be of value to farmers in making farm plans and adjustments in their farm operations. Information regarding length of growing season, temperatures, precipitation and variations in these during specified periods and the relationship between climatic factors and crop conditions should be of value in determining what climatic risks are probable and which crops are best adapted to a particular area.

While annual variations in crop yields are primarily dependent on climatic conditions one must not overlook other factors which may have a very marked effect on yields. Insect pests or crop diseases may reduce yields or completely destroy crops in spite of favorable weather conditions. Crop yields may also be greatly affected by short periods of adverse weather conditions, such as the occurrence of hot dry weather during the pollination period for corn.

No set rules or absolute conclusions can be made regarding the relationship between yields and climatological factors; if, however, other factors are given due consideration much can be learned regarding the effect of climatic factors on crop yields. It is believed, for example, that if variety of crop and time of planting are given careful consideration much can be done to abate losses from weather adversities.

Table 1. Summary of Weather Observations, 1913 to 1941

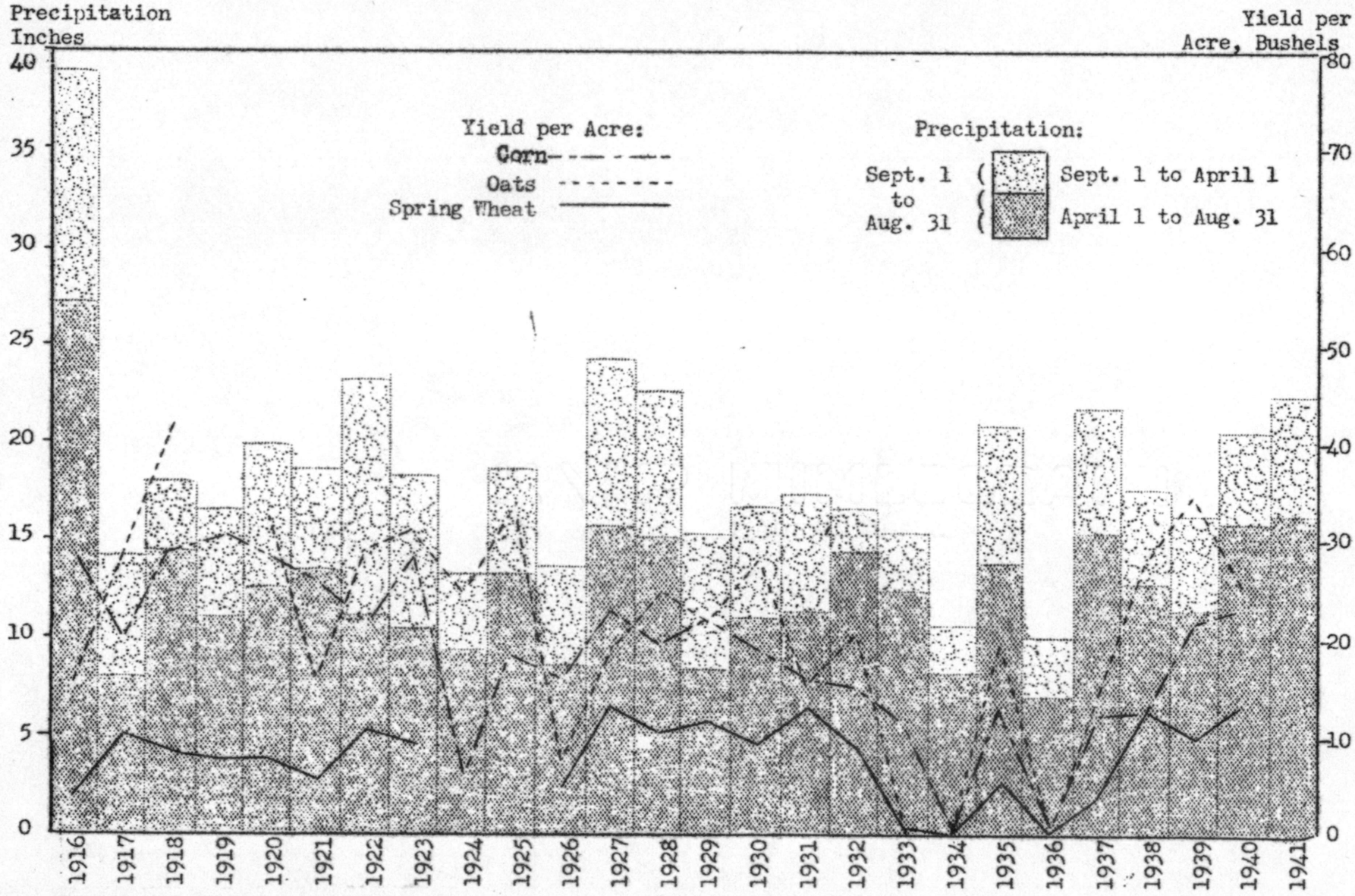
Britton Weather Station

ELEVATION IN FEET	1352
GROWING SEASON	
Average date of last killing frost in spring	May 8
Average date of first killing frost in fall	September 23
Average length of frost-free period in days	138
Latest recorded killing frost in spring	May 25
Earliest recorded killing frost in the fall	Aug. 25 (1934)
Longest recorded growing season in days	160 (1933)
Shortest recorded growing season in days	120 (1934)
PRECIPITATION IN INCHES*	
For the Calendar Year, Jan. 1 to Dec. 31	
Average	19.42
Highest recorded	35.59 (1916)
Lowest recorded	12.02 (1936)
For the Crop Year, Sept. 1 of previous year to Aug. 31 of designated year	
Average	19.32
Highest recorded	39.26 (1916)
Lowest recorded	10.55 (1936)
For the Growing Season, April 1 to Aug. 31	
Average	13.20
Highest recorded	27.30 (1916)
Lowest recorded	7.20 (1936)
For the Critical Period for Small Grain, May 1 to June 30	
Average	6.26
Highest recorded	12.43 (1916)
Lowest recorded	1.78 (1929)
For the Critical Period for Corn, May 1 to July 31	
Average	8.69
Highest recorded	19.68 (1916)
Lowest recorded	3.12 (1936)
TEMPERATURE	
Average annual temperature	44.4°
Highest recorded -- Degrees above zero	114° (1936)
Lowest recorded -- Degrees below zero	42° (1936)

* All rainfall, snow and other moisture measured as inches of water.

COMPARISON OF PRECIPITATION AND CROP YIELDS

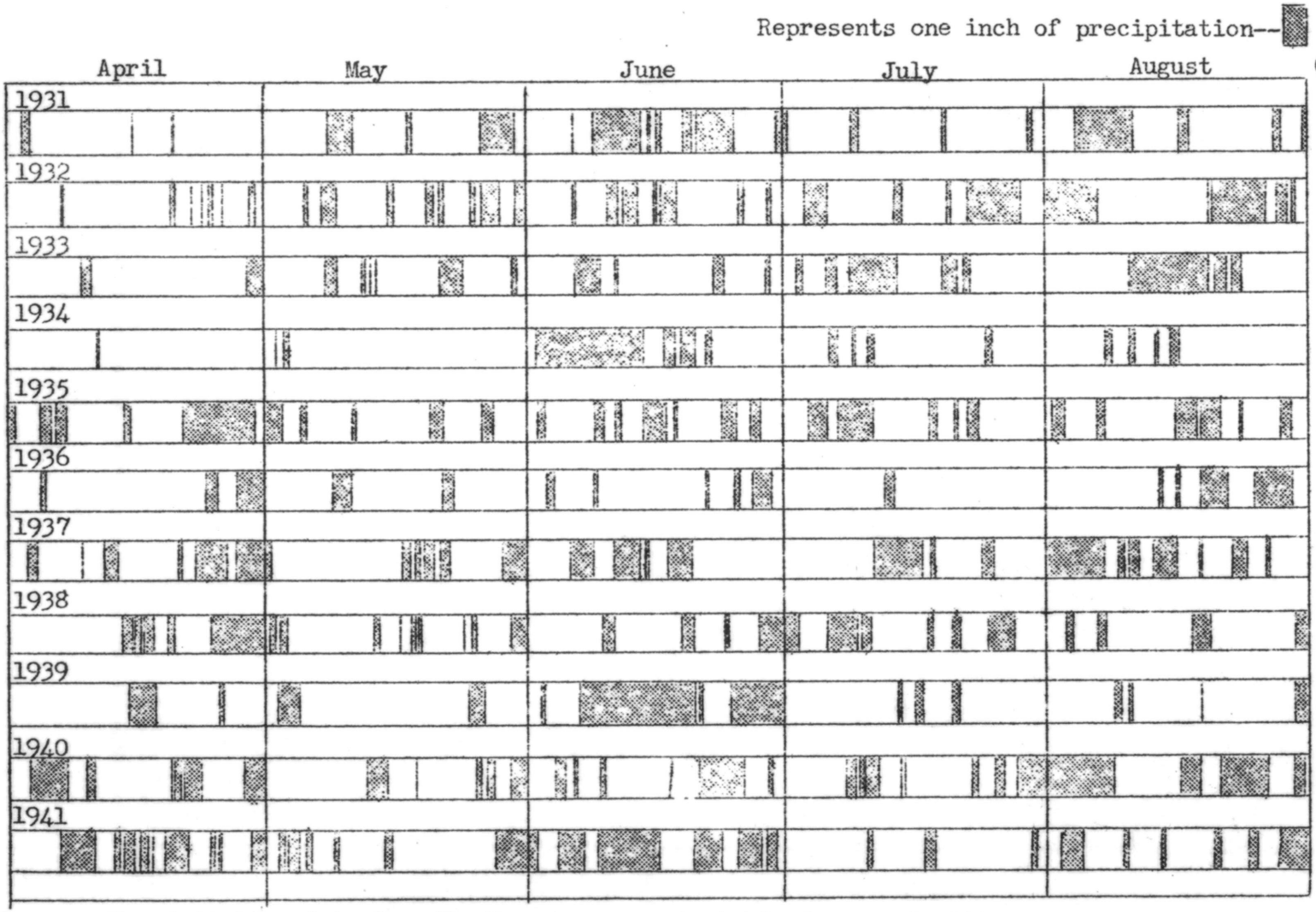
Britton Weather Station - Marshall County



Source: Tables II and III

Fig. 1-Precipitation is probably the most important factor affecting crop yields.

SUMMER PRECIPITATION, MARSHALL COUNTY, 1931 - 1941



	Yields Per Seeded Acre			
	Corn	Oats	Barley	Wheat
1931	16.6	15.5	13.6	10.2
1932	15.6	21.0	15.3	9.3
1933	7.0	.8	.3	.8
1934	.2	.0	.1	.0
1935	13.0	25.2	14.3	7.1
1936	1.4	.1	.2	.4
1937	12.2	15.3	7.5	5.2
1938	12.6	28.6	17.4	12.2
1939	21.4	34.7	23.1	11.6
1940	23.0	25.4	19.3	12.2

Source: Precipitation data from Weather Bureau and yields from table III.

Fig. II. The amount and distribution of precipitation during the growing season has an important effect on crop yields.

DAYS WITH TEMPERATURES ABOVE 90 DEGREES
Britton Weather Station
May 1 - Aug. 14

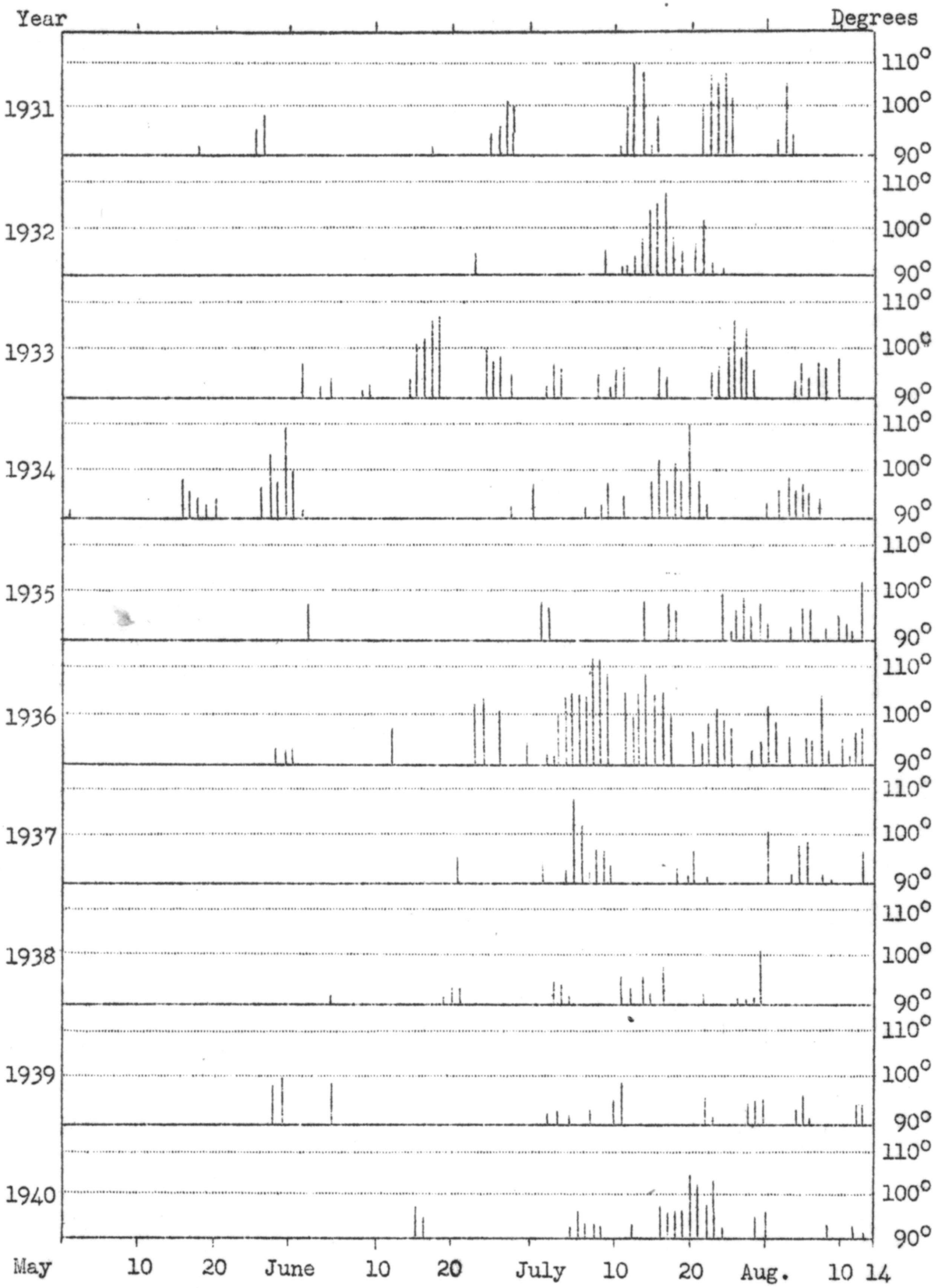
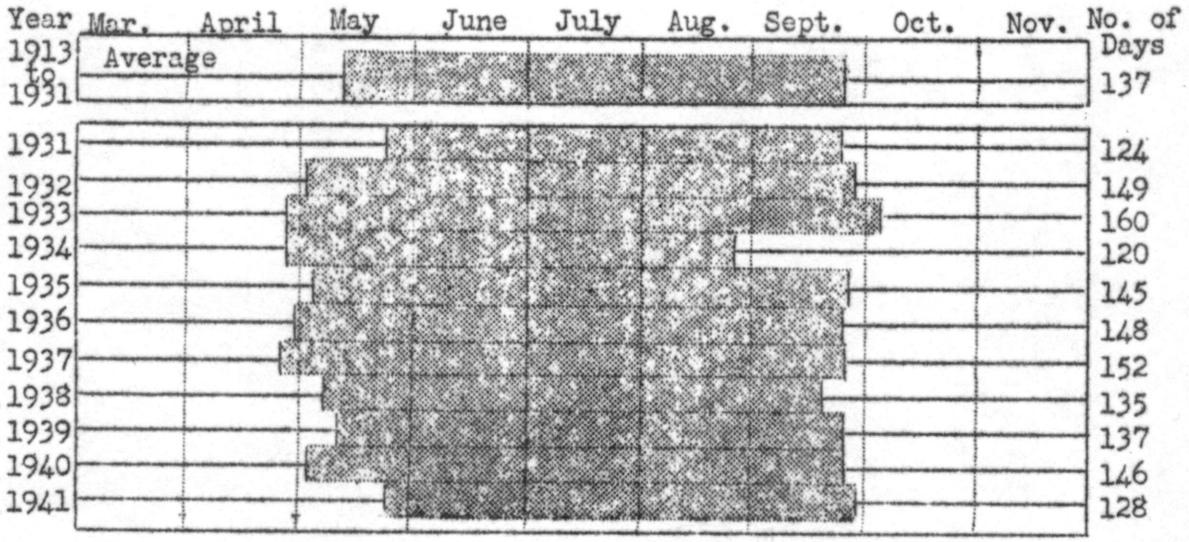


Fig. III. The vertical lines represent the highest temperatures of each day if over 90°.

The Number and Distribution of Frost-Free Days, 1913-1941
Britton Weather Station



Data for individual years 1913-1931 is not available in published reports; however, the average for this period is given. There was an average of 137 frost - free days for the period 1913-1941. For the period 1931-1941 the longest growing season recorded was 160 days, while the shortest was 120 days.

Fig. IV

Table II

Marshall County

PRECIPITATION

Britton Weather Station, 1913 - 1941

Year	Crop Year Sept. 1 - Aug. 31		Short Growing Season April 1 - July 31		Long Growing Season April 1 - August 31		Calendar Year Jan. 1 - Dec. 31	
	Inches	Percent of 1913-1941 Av.	Inches	Percent of 1913-1941 Av.	Inches	Percent of 1913-1941 Av.	Inches	Percent of 1913-1941 Av.
1913			8.39	80	11.00	83		
1914	24.09	125	18.13	173	18.90	143	25.11	129
1915	28.73	149	16.59	158	20.04	152	31.92	164
1916	39.26	203	21.85	208	27.30	207	35.59	183
1917	14.23	74	5.95	57	8.19	62	12.75	65
1918	18.62	96	11.48	109	14.55	110	19.37	99
1919	16.66	86	10.92	104	11.36	86	18.94	97
1920	20.05	104	11.78	112	12.77	97	18.09	93
Av. 1913-1920	23.09	119	13.14	125	15.51	117	23.11	119
1921	18.66	96	10.89	104	13.47	102	22.68	116
1922	23.55	122	10.20	97	11.59	88	21.12	109
1923	18.51	96	9.50	91	10.68	81	15.24	78
1924	13.43	69	7.10	68	9.59	73	15.59	80
1925	18.84	97	11.16	106	13.52	102	18.56	95
1926	13.84	72	3.52	34	8.83	67	17.25	89
1927	24.47	127	14.27	136	15.88	120	23.77	122
1928	22.75	118	8.83	84	15.22	115	21.22	109
1929	15.44	80	7.35	70	8.54	65	15.11	78
1930	17.06	88	9.47	90	11.23	85	16.50	85
Av. 1921-1930	18.66	96	9.23	88	11.86	90	18.71	96

Table II Con't

PRECIPITATION

Britton Weather Station, 1913 - 1941

Year	Crop Year Sept. 1 - Aug. 31		Short Growing Season April 1 - July 31		Long Growing Season April 1 - August 31		Calendar Year Jan. 1 - Dec. 31	
	Inches	Percent of 1913-1941 Av.	Inches	Percent of 1913-1941 Av.	Inches	Percent of 1913-1941 Av.	Inches	Percent of 1913-1941 Av.
1931	17.52	91	8.55	82	11.54	87	16.51	85
1932	16.69	97	10.23	98	14.68	111	17.59	90
1933	15.51	80	8.11	77	12.49	94	15.12	78
1934	10.86	56	7.51	72	8.41	64	13.26	68
1935	21.12	109	10.83	103	13.96	106	18.75	96
1936	10.55	55	4.83	42	7.20	54	12.02	62
1937	21.99	114	11.13	106	15.58	118	21.14	109
1938	17.61	91	11.19	107	12.90	98	17.97	92
1939	16.27	84	10.49	100	11.53	87	15.46	79
1940	20.75	107	10.83	103	16.15	122	22.85	117
Av. 1931-1940	17.09	88	9.32	89	12.44	84	17.07	88
1941	22.45	116	13.59	130	16.37	124	25.61	132
Av. 1913-1941	19.34		10.49		13.22		19.47	

Table III

Yield Per Acre of Various Grain Crops, Marshall County, 1916-1941[1]

Year	Corn	Winter Wheat	Durum[2] Wheat	Spring[2] Wheat	Oats	Barley	Rye	Flax
1916	29.4			4.3	16.0	12.9	5.0	11.3
1917	20.5			10.9	29.0	21.0	12.5	10.0
1918	28.7			18.5	42.5	31.0		
1919	30.5			8.0			8.0	
1920	28.5			8.0	32.5	24.5	8.2	9.3
Av. 1916-20	27.5			9.9	30.0[3]	22.4[3]	8.4[3]	10.2[3]
1921	26.5			6.0	15.0	12.5	17.0	7.5
1922	22.0			11.0	29.0	21.0	20.0	10.0
1923	28.5			9.5	31.0	19.0	10.0	8.0
1924	5.8	Yield per Seeded Acre[4]			25.0	19.2	12.9	7.7
1925	18.3				33.6	23.0	8.0	7.3
1926	16.5	3.3		5.1	7.1	9.4	2.3	5.2
1927	23.0	19.3		13.3	18.5	27.2	18.3	9.1
1928	20.0	8.3	11.2	10.6	24.6	23.2	6.9	6.4
1929	22.0	10.7	11.0	11.4	22.7	15.0	10.3	6.0
1930	19.4	9.2	11.6	9.6	28.1	20.7	12.4	6.0
Av. 1921-30	20.2	10.2[3]	11.3[3]	9.6[3]	23.5	19.0	11.8	7.3
1931	16.6	6.5	8.8	12.9	15.5	13.6	7.6	1.5
1932	15.6		9.5	9.2	21.0	15.3	10.0	2.8
1933	7.0	1.0	.4	1.0	.8	.3	2.3	1.5
1934	.2		.0	.0	.0	.1		.2
1935	13.0		9.5	5.7	25.2	14.3	13.2	5.2
1936	1.4	1.2	.4	.5	.1	.2	.8	.2
1937	12.2		5.6	4.0	15.3	7.5	7.8	2.8
1938	12.6	3.4	11.7	13.5	28.6	17.4	9.3	7.3
1939	21.4	8.0	12.5	10.4	34.7	23.1	3.9	7.0
1940	23.0	12.0	11.9	12.9	25.4	19.3	10.9	5.7
Av. 1931-40	12.3	5.4[3]	7.0	7.0	16.7	11.1	7.3[3]	3.4
Av. 1916-40	18.5	7.5[3]	8.0[3]	8.5[3]	21.7[3]	16.3[3]	11.3[3]	6.0[3]

1/ Farm Production and Prices, 1890-1926, Agr. Exp. Sta. Bulletin #225
South Dakota Agricultural Statistics, 1924-1936, U.S.D.A. (Unpublished)
South Dakota Agricultural Statistics, Annual Report, 1937-1940, U.S.D.A.

2/ Durum Wheat yields were included with spring wheat for the period 1916-1928.

3/ Average for years reporting.

4/ Prior to 1924 records do not tell whether yields were per harvested or seeded acre.